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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:
J. Yong Ryu et al.

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Atty. File: CDT 1694

Serial No.: 10/071,341

Group Art Unit: 1764

Filed: 02/08/02

Examiner: W. D. Griffin

For: Process for the Conversion of Mixed C₄ and C₅ Streams to Motor Fuel

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL

[X] BRIEF (in triplicate)

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Respectfully submitted,

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Date: 01/21/04

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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Ryu et al

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FUEL

BRIEF ON APPEAL

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I.

REAL PARTY IN INTEREST

The subject patent application is assigned of record to Catalytic Distillation Technologies. Therefore, the real party in interest is Catalytic Distillation Technologies

II.

RELATED APPEALS

There are no related appeals or interferences known to appellants or appellants' legal representative which will directly or indirectly affect or be affected by or have a bearing on the Board's decision in this appeal.

III.

STATUS OF CLAIMS

Claims 1-5, 7 and 8 remain in the application. All of the claims were rejected. Claims 4 and 5 are withdrawn from appeal. Claims 1, 2,3, 7 and 8 remain on appeal.

IV.

STATUS OF AMENDMENTS

All amendments have been entered.

V.

SUMMARY OF THE INVENTION CLAIMED ON APPEAL

The following summary is taken verbatim from the patent application at page 1 line 20 to line 28.

"In brief the present invention comprises an integrated process for the conversion of mixed C₄ or mixed C₅ alkane streams to produce motor gasoline. The mixed alkane stream is first subjected to separation of the isoalkane from the normal alkane as by fractional distillation. The isoalkane is fed directly to an alkylation unit where the isoalkane is reacted with a normal olefin to produce a branched paraffin. A portion of the normal

alkane may be subjected to isomerization to isoalkane which is fed to the alkylation unit. From the remainder of the normal alkane a portion is dehydrogenated to normal olefin which is then used as the olefin feed for the alkylation." The product from the dehydrogenation, which comprises normal olefins and alkanes, is fed to a selective hydrogenation to remove very small amounts of dienes normally present in such a product stream. (Spec. page 2, lines 14-17).

VI. ISSUE

1. Are claims 1, 2,3, 7 and 8 *prima facie* obvious over U.S. 2,314,435 (Allender) in view of U.S. 4,520,214 (Vora)?

VII. GROUPING OF CLAIMS

Claims 1, 2,3, 7 and 8 are grouped together.

VIII. ARGUMENT

A. The Rejection

In the Final Office Action:

Claims 1, 2,3, 7 and 8 were rejected under 35 USC § 103 as being obvious over U.S. 2,314,435 (Allender) in view of U.S. 4,520,214 (Vora).

B. The Prior Art

Allender is related to producing a motor fuel from C₄ streams and carries out a process where normal butane is separate from isobutane, a portion of the butane is dehydrogenated to butene, another portion of the n-butane is isomerized to isobutane and the n-butene and isobutane reacted to form alkylate (C₈). All of the present claims recite

the production of diene in the dehydrogenation and the selective hydrogenation of the diene in another step. The examiner acknowledges that Allender does not disclose the selective hydrogenation step and cites Vora to cure the defect in the art by combining the references.

Vora discloses selective hydrogenation of dienes contained in a dehydrogenation zone effluent stream by hydrogenating the dienes *within* the dehydrogenation zone.

C. Issue

ARE CLAIMS 1, 2,3, 7 AND 8 *PRIMA FACIE* OBVIOUS OVER U.S. 2,314,435 (ALLENDER) IN VIEW OF U.S. 4,520,214 (VORA)?

The examiner acknowledges that Allender does not disclose the selective hydrogenation step and cites Vora to cure the defect in the art by combining the references.

"A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of the invention, to consider the thinking of one of ordinary skill in the art, guided by the prior art references and the then-accepted wisdom in the field." *In re Kotzab*, 217 F.3d 1365, 1369-70, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000). When one considers the rejection in this light, the evidence is seen to be inadequate to support the rationale as advanced by the examiner. While Vora discloses selective hydrogenation of dienes contained in a dehydrogenation zone effluent stream within the dehydrogenation zone, the present claims all recite that the *effluent* from dehydrogenation is treated to selectively hydrogenate said dienes. Applicants do not claim the *in situ* selective hydrogenation of Vora. There is no incentive from the Vora *in situ* selective hydrogenation alone to introduce a separate hydrogenation step in the

Allender process, in view of the absence of any suggestion of the need to so treat the Allender stream.

It is not obvious to employ the recited components because there is no teaching or suggestion to combine anyone with any other component. References are not properly combined if there is no suggestion therein that they should or could be combined, absent applicant's disclosure. *Ex parte Lennox*, 144 USPQ 224; *In re Stephens, et al.*, 145 USPQ 656; *Ex parte McKay*, 147 USPQ 220; *In re Pye, et al.*, 148 USPQ 426; *In re Imperato*, 179 USPQ 730. See also *Ex parte Levengood*, 28 USPQ2d 1300 (BdPatApp 1993). The examiner can satisfy the burden of showing obviousness of the combination “only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references”, *In re Lee*, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002), citing *In re Fritch*, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992). In the present situation the record contains no evidence of a motivation, the mere assertion that the modification of Allender's process by Vora is “obvious” because Vora removes impurities in its process for downstream uses unrelated to the present field of art, by the examiner is not “objective prior art” to present such evidence.

Vora teach that their apparatus has a single dehydrogenation/selective hydrogenation zone. (Abstract- col 1, first ¶ of the Brief Summary- col. 2 et seq.). Thus, on the basis of the disclosure of the reference, whether it is correct or not the combination proposed by the examiner is proper, the combination fails to make a *prima facie* case of obviousness, because the present claims recite treating the effluent from the

dehydrogenation and hydrogenating in a separate zone. "Obviousness cannot be established by combining teachings of the prior art to produce the claimed invention, *absent* some teaching suggestion or incentive supporting the combination." *In re Geiger*, 2 USPQ2d 1276 (CAFC 1987). Hence, without the requisite teaching, suggestions or incentives there is no *prima facie* case and the rejection must fail. The court was addressing piece meal combination of teachings, which could be argued met the claims, however, the proposed combination does not even meet the claims of the present invention and does not even rise to the level of putative *prima facie* case. See also *In re Fine*, 5 USPQ2d 1596 and *Ex parte Levengood*, 28 USPQ2d 1300 (BdPatApp 1993).

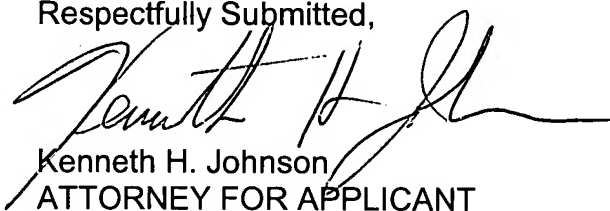
In an even more compelling line of cases it is well established that references are not properly combined if there is no suggestion therein or no evidence that those skilled in the art would select the art that they should or could be combined absent applicant's disclosure *Micro Chemical Inc. v. Great Plains Chemical Co.*, 41 USPQ2d 1238, 1244 (fed. cir. 1997); *In re Imperato*, 179 USPQ 730 (CCPA 1973); *In re Pye, et al.*, 148 USPQ 426 (CCPA 1966); *In re Stephens, et al.*, 145 USPQ 656 (CCPA 1965); *Ex parte McKay*, 147 USPQ 220 (BdPatApp 1965); *Ex parte Lennox*, 144 USPQ 224 (BdPatApp 1965). See also *Ex parte Levengood*, 28 USPQ2d 1300 (BdPatApp 1993). It is submitted that the combination as proposed by the examiner is based on the applicants' motivation to make the claimed invention rather any suggestion in the references. Thus, it is not obvious to employ the recited steps because there is no teaching or suggestion to combine any step from one cited reference with any other step of another reference.

D. Conclusion

In summary, the claimed invention requires that isoalkane in a mixed alkane stream is separated from the normal alkane, the isoalkane is fed directly to an alkylation unit where the isoalkane is reacted with a normal olefin to produce a branched paraffin, a portion of the normal alkane is dehydrogenated to normal olefin, the dehydrogenated effluent is hydrogenated to remove dienes and then used as the olefin feed for the alkylation. Neither of the references alone or in combination to carry out the claimed process steps. At best, the disclosures only suggest that it would be obvious to try the claimed invention.

Applicants respectfully request that the board reverse the examiner.

Respectfully Submitted,



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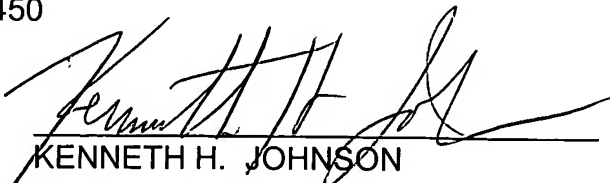
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KENNETH H. JOHNSON

IX.
APPENDIX

A. CLAIMS ON APPEAL

1. A process for upgrading a C₄, C₅ or mixed stream thereof comprising normal alkane and isoalkane to motor fuel comprising the steps of:

- (a) separating the isoalkane from the normal alkane;
- (b) subjecting a portion of the separated normal alkane to dehydrogenation in a dehydrogenation unit to produce a normal alkenes and dienes as an effluent;
- (c) selectively hydrogenating the effluent from (b) under conditions to selectively hydrogenate said dienes; and
- (d) feeding the separated isoalkane and the normal alkenes to an alkylation unit where the isoalkane is reacted with the normal alkenes to form a branched alkane.

2. The process according to claim 1 wherein a portion of the separated normal alkane is subjected to skeletal isomerization to produce more isoalkane.

3. The process according to claim 1 wherein the effluent from the dehydrogenation is selectively hydrogenated under conditions to remove dienes.

7. A process for the production of isooctane from a mixed C₄ alkane stream comprising the steps of:

- (a) separating isobutane from normal butane;
- (b) isomerizing a portion of the separated normal butane to isobutane;
- (c) dehydrogenating a portion of the separated normal butane to produce normal butenes and dienes as an effluent;
- (d) selectively hydrogenating the effluent from (c) under conditions to selectively

hydrogenate said dienes; and

(e) reacting the isobutane and normal butenes under alkylating conditions to produce isooctane.

8. A process for the production of isodecane from a mixed C₅ alkane stream comprising the steps of:

(a) separating isopentane from normal pentane;

(b) isomerizing a portion of the separated normal pentane to isopentanes;

(c) dehydrogenating a portion of the remainder of the separated normal pentane to produce normal pentenes and dienes as an effluent;

(d) selectively hydrogenating the effluent from (c) under conditions to selectively hydrogenate said dienes; and

(e) reacting the isopentane with the normal pentenes under alkylating conditions to produce isodecane.



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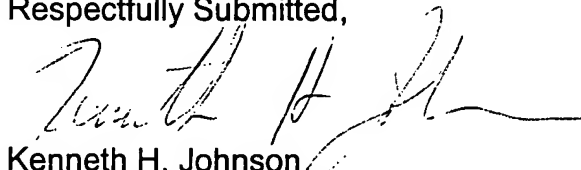
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D. Conclusion

In summary, the claimed invention requires that isoalkane in a mixed alkane stream is separated from the normal alkane, the isoalkane is fed directly to an alkylation unit where the isoalkane is reacted with a normal olefin to produce a branched paraffin, a portion of the normal alkane is dehydrogenated to normal olefin, the dehydrogenated effluent is hydrogenated to remove dienes and then used as the olefin feed for the alkylation. Neither of the references alone or in combination to carry out the claimed process steps. At best, the disclosures only suggest that it would be obvious to try the claimed invention.

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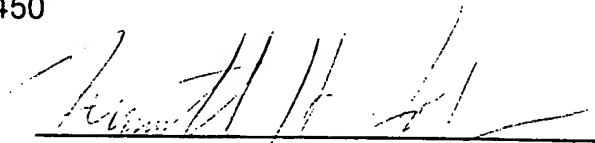
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1. A process for upgrading a C₄, C₅ or mixed stream thereof comprising normal alkane and isoalkane to motor fuel comprising the steps of:

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(b) subjecting a portion of the separated normal alkane to dehydrogenation in a dehydrogenation unit to produce a normal alkenes and dienes as an effluent;

(c) selectively hydrogenating the effluent from (b) under conditions to selectively hydrogenate said dienes; and

(d) feeding the separated isoalkane and the normal alkenes to an alkylation unit where the isoalkane is reacted with the normal alkenes to form a branched alkane.

2. The process according to claim 1 wherein a portion of the separated normal alkane is subjected to skeletal isomerization to produce more isoalkane.

3. The process according to claim 1 wherein the effluent from the dehydrogenation is selectively hydrogenated under conditions to remove dienes.

7. A process for the production of isooctane from a mixed C₄ alkane stream comprising the steps of:

(a) separating isobutane from normal butane;

(b) isomerizing a portion of the separated normal butane to isobutane;

(c) dehydrogenating a portion of the separated normal butane to produce normal butenes and dienes as an effluent;

(d) selectively hydrogenating the effluent from (c) under conditions to selectively

hydrogenate said dienes; and

(e) reacting the isobutane and normal butenes under alkylating conditions to produce isooctane.

8. A process for the production of isodecane from a mixed C₅ alkane stream comprising the steps of:

(a) separating isopentane from normal pentane;

(b) isomerizing a portion of the separated normal pentane to isopentanes;

(c) dehydrogenating a portion of the remainder of the separated normal pentane to produce normal pentenes and dienes as an effluent;

(d) selectively hydrogenating the effluent from (c) under conditions to selectively hydrogenate said dienes; and

(e) reacting the isopentane with the normal pentenes under alkylating conditions to produce isodecane.